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ABSTRACT

The growing pressures and the complex conditions which now bear upon research libraries are not adequately reflected in the development of policies, plans or current service activities. In the place of current, reliable, and extensive information which might be reflected in decisions and actions, librarians seem to operate normally on the basis of only a few guidelines and these typically are rather outdated, arbitrary, and indiscriminate, especially in the way they seek to serve the various special fields represented in research. Improvement in the adequacy of library plans and decisions could be expected by systematically accumulating and disseminating greater quantities of new and descriptive information concerned with the broader environment of research libraries. (Author/MM)

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A SUGGESTED METHODOLOGY FOR RELATING RESEARCH COLLECTION CRITERIA TO DISCIPLINES AND TO EDUCATIONAL PROGRAM QUALITY

A Planning Study Report to

Council on Library Resources, Inc., Washington, D.C.

by

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Introduction

The proposed investigation the main elements of which are developed here has its origins in several recent events confirming the need for data helping to characterize research libraries and their roles. To begin the development, it is first necessary to describe several of the more troublesome and unresolved questions from library funders, professional librarians, and library users associated with research libraries, since it is out of these questions about these libraries that we can justify the proposed work.

It is quite apparent that research or research and development activities are placing constantly increasing burdens on a similarly growing number of research libraries. Professional librarians have been slow to demand or initiate adequate research and development on library problems, but there is reason enough for such initiative even in the morally Platonic demand that we librarians should know ourselves; there are also bound to be utilitarian and Benthamite benefits in pay-off by way of attraction and justification of improved funds and library services (Munn, 1968).[1] In the United States and, in varying degrees, elsewhere, the indexes of activity in research and scholarship are advancing: funds for research are being regularly enlarged (see, e.g., U.S. Bureau of Census, 1968), enrollments in graduate programs are still growing (e.g., National Center for Educational Statistics, 1966), new research specialties are finding favor with funding agencies and are taking their

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[1]Author names and dates appearing in parentheses refer to items in the bibliography.

place alongside the established and more affluent specialties (e.g., Carter, 1965; Keeney, 1965), and the supporting research libraries are also enlarging at an accelerating pace (Dunn, Seibert, & Scheuneman, 1968, p. 13). These are only some of the signs that research and attendant scholarship are broad and robust enterprises.

The varieties of pressures and complications that arise from these expensive, growing enterprises are almost indescribable and they become especially severe within research libraries, where the available and pertinent guidelines for change are meagre and too often obsolete. Even in a more stable setting, one with slower rates of growth and expansion, the difficulties would be impressive. For example, there still would be major problems stemming from inflation, from the keen competition for capable personnel, and from the need to exploit many new and potentially valuable technologies. But beyond these problems, research librarians must try also to deal with the unpredictable ways in which special research fields are born out of mergers and out of differentiation of existing fields (and often, it would seem, out of something akin to spontaneous generation). There are further strains which arise from the need to serve many heterogeneous specialties or clienteles--humanist and scientist, novice and mature investigator, wealthy and impecunious projects, and locally experienced or transient, occasional clients.

If anyone ever seriously proposed that a research library's problems could be solved by the application of funds sufficient to allow the collection of all materials in the fields of interest, the time for such proposals has long since passed. Not only do new research publications in most

special fields exceed the quantity which the most efficient reader-specialist can survey (Licklider, 1966, p. 1044; Price, 1956), they also exceed by a wide margin the research library's ability and resources in collecting. Both the reader-specialist and the library must be highly selective in determining which literature to consider. Furthermore, like the other sources of current problems in research libraries, this need for greater selectivity continues to grow more acute.

The growing pressures and the complex conditions which now bear upon research libraries are not adequately reflected in the development of policies, plans or current service activities of these libraries. Instead, in the place of current, reliable, and extensive information which might be reflected in decisions and actions, librarians seem to operate normally on the basis of only a few guidelines (e.g., Downs, 1967, Clapp and Jordan, 1965, Trueswell, 1966) and these typically are rather outdated, arbitrary, and indiscriminate, especially in the way they seek to serve the various special fields represented in research.

There are several immediate and clear possibilities for proceeding beyond the present conditions and the first of these might properly be to accumulate systematically and to disseminate greater quantities of new and descriptive information concerned with the broader environment of research libraries. From the resulting awareness of status and trends, some improvement in the adequacy of library plans and decisions could be expected. In addition and more specifically, however, for a library to respond well to the demands placed upon it by research and scholarship, it probably can do no better than to imitate the salient features of its most

successful counterparts. Currently, though, two principal obstacles effectively restrict such imitation and they are, first, that the detailed features of successful libraries and collections are essentially unknown and, secondly, that no important effort has been invested to identify features which are salient and contributive to success and others which are probably only correlated and coincidental. Further effort also needs to be given to the study of library usage differences across fields of research or disciplines and to the clearer identification of usage patterns which differentiate special research fields. As of now, too little is known about these habits and their attendant special requirements, even though it is well known that different disciplines and special fields frequently have their own forms of communication and of library materials utilization (Menzel, 1966, Herner, 1958).

It also seems likely that an important need in research library planning and policy making is not just for better and more detailed reports, to reveal present status of research libraries in cross-section or as "snapshots," but also for greater attention to developmental, longitudinal, and dynamic characteristics of libraries. Quite possibly, for example, the number of periodical volumes in a collection is not so sensitive an index of quality or utility as would be an index of the current rate of periodicals acquisitions or the rate of change in these acquisitions during the past few years. Such suspicions stem from the knowledge that, in the sciences at least, a disproportionate burden is carried by a few of the most recent periodical volumes (Cole, 1963). The many other volumes, no matter how numerous, are of much less consequence in their contributions to that area of scholarship.

A desire to refine the present broad understandings of the features contributing to adequacy and excellence in research library collections comes readily from the realization that so little has yet been systematically attempted on these questions; it comes also from recognizing the great importance the questions carry, both in their influence on the effectiveness of research and in their great financial implications. At the same time, it is understandable that so little work has yet been done. Many of the pressures, notably the heightened tempo of scholarship in action, and of the related questions are of rather recent origin. In addition, investigators are properly reluctant to undertake the unravelling of a complex in which causes, correlates, and effects are thoroughly intertwined, especially when the most influential variables could prove to be effectively beyond control--for example, perhaps "great faculties cause great collections." And finally all this is complicated by the need to refine, by means of a detailed examination, the library needs and uses of the various <u>disciplines</u>. Unfortunately, "discipline" is itself one of those conveniently flexible terms which can delude the user into the supposition of clear and specific meaning.

Now, to review briefly, what is sought here is the translation of general and well-intentioned interests in the most central problems of research libraries into the evolution from those interests of a promising plan for the execution of certain selected investigations. It seems clear at this point that the already large responsibilities of these libraries are still expanding rapidly. The problems to be dealt with cannot be met just with funds and with very great expansions of collections, even if these options

were open. Neither can plans and policies be based on the few, meagre and often obsolete guidelines that are used now. Instead, just for one thing it is time to undertake some empirical but also systematic work, discipline by discipline, to study the characteristics of collections, of their uses, and of the correlates and contributing causes of their "success-in-use."

Considerations in Study Design

Intermediate between the development and description of any one scholarship's needs and the later statement of study procedures appropriate to these needs, it is desirable to indicate something of the evolution of the choices. The procedures do not of course emerge directly out of the described needs, but must instead be designed and selected to represent each need efficiently. It must be stressed also that with problems-needs which are as broad and as uncharted as those underlying the presently proposed research, the procedural alternatives and choices are unusually numerous; beneath each of the apparent choices, there are several embryonic procedures and several discarded options. The major and remaining choices are discussed below.

The focus of the contemplated research is upon the features of research libraries and, especially, of research collections which correlate with (and are most predictive of) success and "non-success" of the collections in their support of research and scholarship. This research focus is derived from the inescapable conviction that current guidelines are weakened principally by the absence of known relationships between their main recommendations and separate measures of collections' success-in-use. To refine these important and

expensive decisions, they must become related to suitable criteria of success, to valid and procedurally independent information.

The problems of locating or developing "suitable criteria..." could be acute if it were not for the recently completed "Cartter report" (Cartter, 1966), which fortunately provides an excellent basis for such criteria. As unlikely as it may be that institutional success in research, scholarship, and related activities can be reliably identified, it is nevertheless true that Cartter's procedures and major findings are difficult to fault. He provides a well executed and generally well accepted assessment of graduate programs and faculties which can serve very usefully in the further study of many related library collections.

Beyond the need to relate features of research collections to the success-in-use of these collections, there is a second major need also to be represented in the study procedures. It is that of examining systematically and in relation to suitable criteria, interdisciplinary differences in the salient features of research collections. Again, to contrast this with most prevalent guidelines, they give little or no recognition to the substantial and documented differences among disciplines in their library service needs (see, e.g., Herner, 1958). With the continuing differentiation of disciplines or special fields which is so evident and with the related differentiation of their library requirements, it is crucial to understand better the extent and implications of these differences.

In developing the present plans and report, probably the most intriguing and troublesome question was that of the variation in the breadth or scope of disciplines. As

indicated earlier, the term "discipline" is deceptive and it can suggest, as perhaps it did to the promulgators of some existing guidelines, that it applies with constant meaning to each academic specialty. French, electrical engineering, sociology, and physics are all disciplines and all typically have parallel administrative units in the organization of one university or another. Also, within each unit, a range of more specialized instructional and research programs are commonly conducted. However, when the task is to identify the quantity and varieties of literature required to support research in each field, are similarities still evident? In the absence of sound information supporting the assumed similarity, it must be seriously questioned. No known forces assure that disciplines shall be created equal and their subsequent advances in academe are also influenced unevenly by countless forces which must serve to compound earlier dissimilarities.

Proceeding on the belief that disciplines differ substantially in scope, breadth, or intellectual variety and that they differ correspondingly in the quantity and varieties of literature required to support research, how shall these differences be recognized and dealt with? Two means which were briefly considered and then discarded were (a) to limit consideration to a few disciplines for which the argument of equivalence could be effectively advanced, i.e., to create homogeneity by means of careful selection, or (b) to assume that breadth or scope is reflected in the size of a discipline's research agenda. This idea still holds some attraction, but its main difficulty is that disciplines rarely proclaim agenda and no reliable methods can be conceived for gaining access to their implicit agenda.

The method finally adopted and adapted for gauging discipline breadth is derived from the "type-token ratio", an index first developed and used in readability research, as well as in other linguistic research (see, e.g., Vogel & Washburne, 1927-28, Carroll, 1964, Miller, 1951). Normally, this ratio is employed as a measure of verbal or vocabulary diversity (and indirectly, of intellectual depth or power) and as such it can index a characteristic of a speaker or author analogous to that characteristic of a discipline which is of interest here. Normally, the ratio is based on the vocabulary found in a recorded language sample, but the present adaptation will substitute bibliographic entries from a sampling of a discipline's research reports for the vocabulary elements. Nevertheless, in either case, the point can be made that large ratios identify individuals or disciplines which are intellectually broad, rich, and varied.

In a typical application of the type-token ratio, each word in the recorded language sample is counted as a token and each different (or unique) word is a type. The greater the number of distinct types within a given number of tokens, the greater the ratio. When used in the study of written passages, rather than the study of authors of passages, these ratios are found to be negatively correlated with and highly predictive of the comprehensibility or readability of the passages. Again, in an analogous way, it seems likely that the type-token ratio of a discipline will be at least crudely indicative of the extent to which people in general will comprehend or be conversant with the discipline. The "narrower", less diverse disciplines which exhibit the smaller ratios are predicted to be the better known and better understood by laymen. (In discussing this with others, some reservations and competing predictions have emerged, including the

view that narrow disciplines are inevitably very specialized and incomprehensible to laymen. That may be, but as we originally surmised, narrow disciplines may be the ones which less reading will presumably "cover". Hence, the probability that a layman could have "covered" it is greater. In any event, the original prediction is left standing to serve as a "goad", if not as more than that.)

In using type-token ratios, it must be recognized that the ratio's size is not independent of the size of the sample of elements studied. The smaller the sample, the greater is the likelihood that each additional element will be unique, thus increasing the ratio. To control this, the simplest procedure is probably to adopt a standard sample size for the purposes of type-token calculations (e.g., 100 entries) and if more than the standard number are available, to draw only the standard number from the larger group randomly. Somewhat related to this, it is foreseen that literature needs for research will not be simply and successfully predicted just by the observed diversity in the literature which earlier research cites. Both the quantity and the diversity of citations should contribute to prediction, so methods for recognizing both deserve consideration. Finally, it is useful to consider further variations on the type-token ratio and their uses in the present context or in related work. Even though the proposed variation, based on bibliographic entries as elements, seems most promising for present purposes, other variations might be considered, such as ratios which treat authors (or only senior authors) as elements, ratios with periodical titles (or all "source" titles) as elements, and even ratios which treat the words (or morphemes) in a sample of research report titles as elements. Each of these

variations and others could bear study as means of indexing the scope or intellectual dispersion of research fields.

Procedures

The contemplated procedures for the study may be divided into two categories of data gathering activity, with these then followed by the further procedures of data analysis and summarization. The two data gathering categories consist, first, of the procedures required to obtain quantified descriptions of specified research collections and, second, of research publications prepared by users of the specified collections.

It is helpful also to conceive of the contemplated procedures as organized into the six structural levels which are represented schematically in Figure 1. There, it can be seen that this proposed study of research collections is concerned with each of five common and broad fields or families of disciplines. These five are widely recognized but come most directly from Cartter (1966) and they include the humanities, social sciences, biological sciences, physical sciences, and engineering. Then, at the next level in the structure and within each broad field, four separate and generally representative disciplines are tentatively identified. In the case of the physical sciences, for example, the four are physics, chemistry, mathematics, and geology. (Before implementing the study, it will be desirable to review again the composition of each of these groups of tentatively designated disciplines and perhaps to substitute some other disciplines which would contribute to the more representative and efficient coverage of each broad field. For purposes of the present descriptions, however, such review poses no complications.)

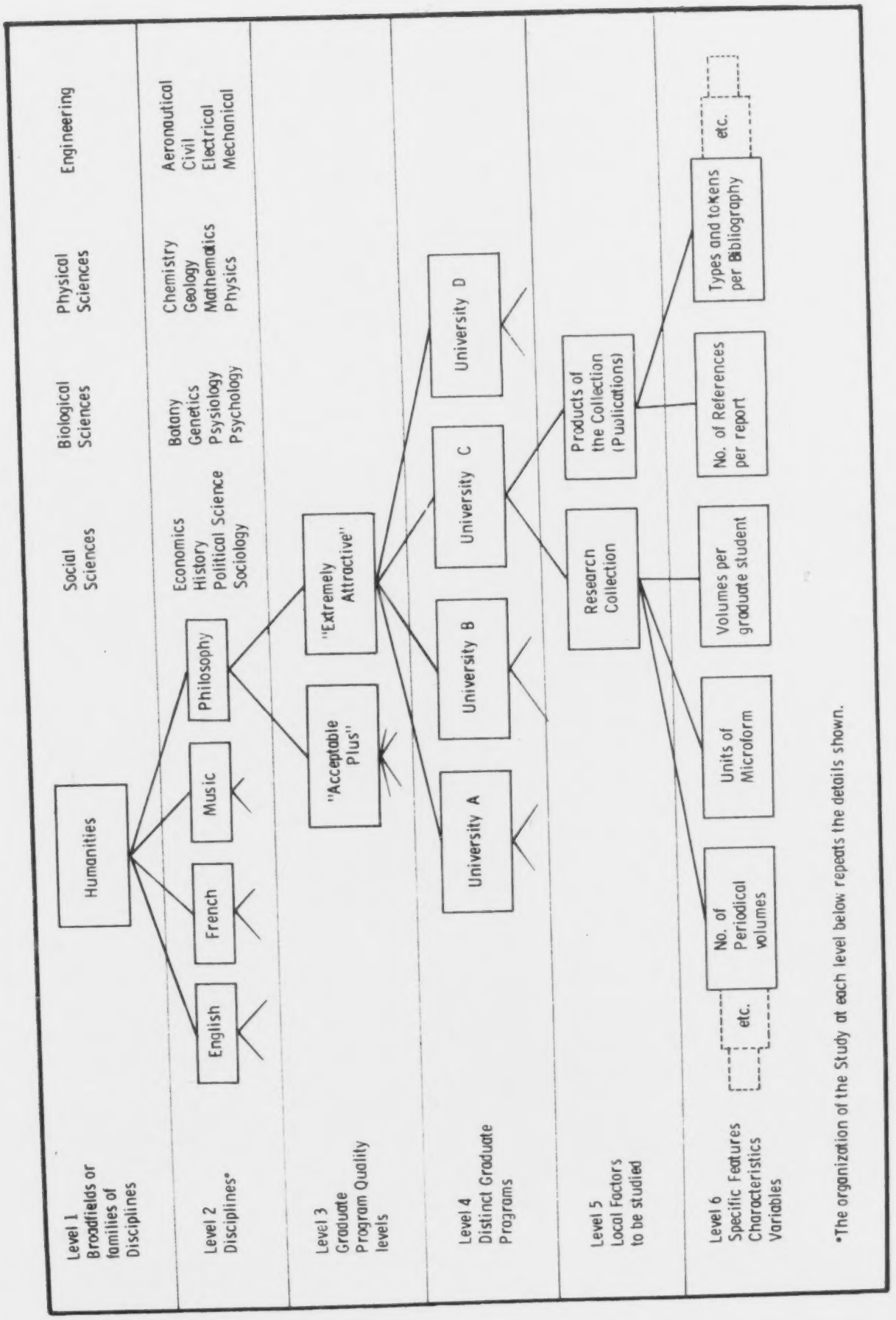

Figure 1. Schematic Representation of the Relationships Among Study Procedures.

At the third level in the study's structure and still following practices based on Cartter (1966), there is a division into two graduate program quality levels. The "high" level includes graduate programs (thus, indirectly, specific universities and faculties) which Cartter identifies as "extremely attractive", but in those cases where fewer than four programs are so classified, additional programs will be drawn from among those in the next lower rank. The second program quality level can be euphemistically dubbed as the "other" level and it corresponds to programs from Cartter's "acceptable plus" rank.[2]

The fourth level in the structure is the level at which individual graduate programs and, thus, individual universities and research collections are identified. The decision has been made that at this level and within each quality level and each designated discipline, four graduate programs will be selected from among those identified by Cartter. The actual selection of individual programs might be conceived of as a simple matter of recording institutional names from those in Cartter's lists; however, some complications must be expected. The first consideration in selection is of course that the graduate program add to the representativeness of the small

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[2]Some thought was given to the selection and use here of graduate programs not mentioned or represented in the Cartter study, rather than those he identifies as "acceptable plus"; however, the stronger reasons seem to favor the present decision. The "unmentioned" programs could too readily appear as weak in numerous respects, including the research collections at their disposal and they would thus stand in stark and relatively useless contrast to the "extremely attractive" programs. On the other hand, the "acceptable plus" programs are themselves worthy of emulation and they offer the further challenge of distinguishing between two similar and yet separable complexes. By analogy, the decision was to undertake the discrimination of aqua from green, rather than green from red.

group in its class which are to be studied. But the decision to include must also give weight to availability of crucial information, to institutional cooperation, and some matters of efficiency in execution of the study. In short, then, this fourth level encompasses the identification of four graduate programs (and their universities and collections) at each of the two quality levels within each of four disciplines which are within each of five broad fields. Programs will first be selected as representative, with this reviewed and perhaps modified to reflect practical considerations.

The fifth and sixth levels in the structure can best be described jointly, since the one is virtually a continuation of the other. The fifth level simply indicates that the information (the data) from each selected graduate program will pertain either to the collection used in support of the program's research or to the products of the research, the publications issuing from the program. Since both collections and research "products" are to be described, different varieties of data or information are required and it is these varieties which are indicated in the sixth level.

In selecting and developing the specific items of information which will be used to describe each collection, there were two principal considerations: First, as indicated earlier, efforts should be made to index developmental, longitudinal, and dynamic features of collection, not just those which reflect a cross-section of static indexes. Secondly, it was desired that a broad range of features be included in the indexes. From these two principal considerations and some others, the following list of collection features emerged:

1. Number of volumes
2. Number of periodical volumes

3. Number of periodical subscriptions
4. Proportion of periodicals less than 5 years old
5. Proportion of periodicals 5-10 years old
6. Proportion of total volumes that is periodicals
7. Expenditures in each of the last 10 years for books, periodicals, and binding
8. Proportion of the books that are less than 5 years old
9. Units of microform
10. Number and types of special ancillary formats
11. Number of graduate students served
12. Number of faculty served
13. Number of FTE librarians assigned
14. Volumes per graduate student
15. Volumes per faculty member
16. Subscriptions per graduate student
17. Subscriptions per faculty member
18. Number of other graduate programs which depend on the collection.
19. Per cent. growth in acquisition expenditures during the last 5 years
20. Estimated proportion of the library burden that is borne by other libraries-collections.

The above, then, are the principal items of information to be gathered with respect to each program and collection studied. The majority of these items can be readily and reliably gathered, but some will of course require approximate procedures to be applied, including some methods of sampling from the collection and estimation on the basis of samples.

To describe the research publications which issue from programs under study, the likely procedures consist first of identifying five senior faculty within each program and, for these purposes, it seems that "senior" should mean that a faculty member shall have been at the institution for a minimum of five years and have the rank of professor or associate professor. Then, a further group consisting of recent advanced degree recipients from the given program will be identified; these should probably be persons for whom the

five senior faculty were committee chairmen. For those ten people, their research publications for the past five years will be identified and a sampling of these publications will be drawn. A total of approximately twenty publications, distributed among the ten investigators, seems desirable. Bibliographies of the twenty publications will be recorded in full, primarily to permit calculation of the applicable type-token ratio, but also to determine the number and spread of references per publication, the extent of the reliance on periodicals and other classes of materials, and the age of the referenced materials.

The principal analyses will consist of statistically summarizing and contrasting the indexes derived for the broad fields, the disciplines, and the program quality levels and derived from the study of collections or research publications' bibliographies. The statistical procedures to be used will be those that are commonly employed in behavioral science research--comparisons of means, nonparametric comparisons of frequencies, correlation analysis, and perhaps discriminant function analysis. In each analysis, however, the purpose will be to identify consistent differences and consistent patterns of differences which distinguish the collections associated with each broad field, each discipline, and each program quality level. A particular effort will also be made to determine the potential usefullness of the proposed type-token ratios in the estimation of collection requirements. If the ratio exhibits some of the sensitivity anticipated for it, further development will be warranted to refine it as an index useful in planning and library evaluation. In addition, the thousands of bibliographic entries taken from the publications in each discipline studied will be analyzed for their potential use as evaluative lists. The main emphasis and

purpose throughout the analyses will be to translate the available evidence into clearly visible relationships useful in the guidance of research library planning and development.

Conclusion

There is a great distance which librarians and, especially, research library planners need somehow to travel, that is, the distance between the arbitrary, sometimes very dubious standards which are still much in evidence and, at the other extreme, the full comprehension of each component contributing to a research library's usefulness and value. That distance cannot be travelled quickly and the full distance surely cannot be travelled at all; however, beginnings must be made. This proposed study is a beginning. It undertakes to look directly and very objectively at the real world and real events of research collections, their disciplines, and research accomplishments. From this, it hopes to achieve some refinement of the present understanding of these broad elements and their relationships.

Eventually, given some success in these early efforts and given also the opportunity to refine and develop further these first successes, useful improvements in the current understandings and current planning procedures can be expected. In view of the great and growing importance of research and in view also of the crucial roles of libraries in research, all improvements, even small ones, are significant and welcome.

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